CLAIMS

1. A process for the alkylation and isomerization of unsaturated linear fatty acids and/or alkyl esters to their aryl branched counterparts which comprises subjecting a feedstock to an alkylation and isomerization reaction in the presence of at least one acidic zeolite catalyst, wherein said zeolite contains ring structures of at least 10 members, and wherein said feedstock comprises unsaturated linear fatty acids, alkyl esters of unsaturated fatty acids or mixtures thereof and at least one aromatic compound.

2. The process according to claim 1 wherein the feedstock comprises of at least 50% by weight of unsaturated fatty acids, alkyl esters of unsaturated fatty acids or mixtures thereof.

3. The process of claim 2 wherein the feedstock comprises of at least 70% by weight oleic acid.

4. The process of claim 1 wherein the feedstock further comprises at least one aryl compound.

5. The process of claim 4 wherein said aryl compound is optionally substituted with at least one heteroatom.

6. The process of claim 4 wherein said aryl compound optionally contains at least one heteroatom in its cyclic ring structure.

7. The process of claim 4 wherein said aryl compound is selected from the group consisting essentially of benzene, toluene, xylene, cumene, aniline, phenol, cymene, styrene, mesitylene, mixtures thereof and the like

8. The process of claim 1 wherein said zeolite comprises at least one of the following framework structures: AEL, AFO, AHT, BOG, CGF, CGS, CON, DFO, EUO, LAU, MTT, NES, PAR, TON, MEL, AFI, ATO, ATS, CAN, LTL, MTW, ROG, AET, UTD-1, VFI, FAU, FER, HEU, AFS, AFY, BEA, BPH, CLO, EMT, FAU, GME, MOR, MFI, MEL, MEN or mixtures thereof

9. The process of claim 8 wherein the SiO_2 /Al_2O_3 ratio of the zeolite is at least 5.

10. The process of claim 1 wherein said acidic zeolite catalyst is characterized a three-dimensional channel pore structure wherein at least one channel structure has a pore size diameter of at least 6Å.

11. The process of claim 10 wherein said zeolite comprises at least one of the following framework structures: CON, DFO, FAU, AFS, AFY, BEA, BPH, EMT, GME, MOR, or mixtures thereof.

12. The process of claim 10 wherein said zeolite contains at least one channel structure having a pore diameter of at least 6.5 Å.

13. A process for the alkylation and isomerization of unsaturated linear fatty acids and/or alkyl esters to their aryl branched counterparts which comprises subjecting a feedstock to an alkylation and isomerization reaction in the presence of at least one acidic zeolite catalyst, wherein said acidic catalyst comprises a mesoporous crystalline phase having pore walls containing primary and secondary crystalline building unit structures.

14. The process of claim 13 wherein said catalyst comprises both mesopores and micropores.

15. The process of claim 14 wherein said catalyst is a mesoporous aluminosilicate or a mesoporous metal containing aluminosilicate.

16. The process of claim 15 wherein said mesoporous aluminosilicate is a mesoporous zeolite.

17. The process of claim 16 wherein said mesoporous zeolite catalyst material comprises mesopores of 15-500Å and primary and secondary nanosized zeolite structural units in the walls that separate mesopores.

18. The process of claim 16 wherein said mesoporous zeolite comprises hexagonal mesopores, the pore wall structures of said mesopores containing primary and secondary zeolite building units.

19. The process of claim 18 wherein said primary and or secondary crystalline building units are based on at least one zeolite selected from the group consisting of zeolite A, Beta zeolite, zeolite X, zeolite Y, zeolite L, zeolite ZK-5, zeolite ZK-4, zeolite ZSM-5, zeolite ZSM-11, zeolite ZSM-12, zeolite ZSM-20, ZSM-35, zeolite ZSM-23, VPI-5 and mixtures thereof.

20. A process for the alkylation and isomerization of unsaturated linear fatty acids and/or alkyl esters to their aryl branched counterparts which comprises subjecting a feedstock to an alkylation and isomerization reaction in the presence of at least one acidic zeolite catalyst, wherein said acidic catalyst comprises at least one metal ion exchanged acidic catalyst, wherein said catalyst comprises at least one non-zero valent metal ion.

21. The process of claim 20 wherein said non-zero valent metal ion is selected from the group consisting essentially of monovalent metal,

divalent metal, trivalent metal, tetravalent metal, pentavalent metal, hexavalent metal and mixtures thereof.

22. The process of claim 21 wherein said higher valent metal is selected from the group consisting Li^{+}, Cu^{+}, Rh^{+}, Ir^{+}, Mg^{2+}, Ca^{2+}, Mn^{2+}, Fe^{2+}, Co^{2+}, Ni^{2+}, Cu^{2+}, Zn^{2+}, Sr^{2+}, Mo^{2+}, Pd^{2+}, Sn^{2+}, Pt^{2+}, Sc^{3+}, Cr^{3+}, Fe^{3+}, Co^{3+}, Ga^{3+}, Y^{3+}, Nb^{3+}, Ru^{3+}, Rh^{3+}, Ir^{3+}, Bi^{3+}, Ti^{4+}, Mn^{4+}, Zr^{4+}, Mo^{4+}, Sn^{4+}, V^{5+}, Nb^{5+}, Mo^{6+}, mixtures thereof and the like.

23. The process of claim 20 wherein the metal ion concentration is at least 0.001% of the exchange capacity of the catalyst support.

24. The process of claim 23 wherein the metal ion concentration is at least 0.5% of the exchange capacity.

25. The process of claim 23 wherein the metal ion concentration is in the range of 0.001 to above 200% exchange level.

26. A process for the alkylation and isomerization of unsaturated linear fatty acids and/or alkyl esters to their aryl branched counterparts which comprises subjecting a feedstock to an alkylation and isomerization reaction in the presence of at least one catalyst selected from the group consisting essentially of acid metal oxides comprising zirconia, niobia, silica, tungstate, or molybdates; polyoxometallates; metal triflates and mixtures thereof.

27. The process of claim 26 wherein said polyoxometallate is a heteropolyacid selected from the group consisting essentially of

$H_4PMo_{11}VO_{40}$
$K_xH_{4-x}PMo_{11}VO_{40}$
$H_5PMo_{10}V_2O_{40}$
$(NH_4)_6P_2Mo_{18}O_{62}$
$H_3PMo_{12}O_{40}$, $H_3PW_{12}O_{40}$
$H_4SiW_{12}O_{40}$, $H_4SiMo_{12}O_{40}$
$H_6P_2V_3W_{15}O_{62}$,
$H_5PMo_{10}V_2O_{40}$
$H_6P_2W_{18}O_{62}$
$H_3PMo_6W_6O_{40}$
$H_5PV_2Mo_{10}O_{40}$

and mixtures thereof.

28. An aryl branched fatty acid or alkyl ester thereof prepared by alkylation and isomerization of one or more aromatic compounds with a feedstock which comprises unsaturated linear fatty acids, alkyl esters of unsaturated fatty acids or mixtures thereof, wherein said alkylation and isomerization is conducted in accordance with any one of the processes of claims 1, 10, 13, 20, or 26.

29. A derivative prepared from the aryl branched fatty acid or alkyl ester thereof of claim 28 wherein said derivative is selected from the group consisting essentially of amphoteric, non-ionic, anionic and cationic surfactants.

30. The derivative of claim 29 wherein said derivative is selected from the group consisting essentially of fatty acid glucamides, glycerol esters, polyhydric esters, sulfoesters, sucrose esters, alpha sulfonates, N-acyl sarcosinates, acylated protein hydrolysates, acyl isethionates, amido propyl amine and derivatives thereof, alkanolamide, ethoxylated alkanolamides, nitriles, N-aryl taurates, soaps, esteramines, esterquats, alkyl polyglycosides (APGs), alcohol sulfates, phosphate esters, polyalkoxycarbonates and mixtures thereof.